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Setting Environmental Quality Standards in Ontario: The Ministry of the Environment's Standards Plan

Executive Summary

The Ministry of the Environment (MOE) sets environmental quality standards to protect human and ecosystem health, prevent damage to the physical environment and minimize offensive odours. Standards are used by the ministry to:

- determine compliance with Ontario's environmental regulations;
- define the legal limits for discharges to air and water for certificates of approval, control orders and program approvals issued under the *Environmental Protection Act* and the *Ontario Water Resources Act*;
- assess general environmental quality and trends in data collected from its surveillance and monitoring programs;
- assist in making decisions during environmental emergencies or chemical spills; and
- assess the need for the cleanup or remediation of contaminated soils and sediment.

In 1996, the Ministry of the Environment released for public comment its standards-setting plan. The plan described the types of standards used by the ministry, provided an overview of the standards setting process and listed priorities for developing new or revised standards. As well as being widely distributed, the plan was posted on the *Environmental Bill of Rights* (EBR) electronic registry on October 10, 1996 for a 60-day comment period.

The updated *Setting Environmental Quality Standards in Ontario* sets out revised priorities for the development of new, or the revision of existing:

- air quality standards;
- Ontario drinking water objectives (ODWOs);
- provincial water quality objectives (PWQO) for surface water;
- biota guidelines – including tissue residue guidelines (TRG) that define contaminant levels in aquatic organisms, vegetation (upper limit of normal or ULN) and sports fish consumption advisories;
- provincial sediment quality guidelines;
- soil quality criteria to facilitate the disposal of contaminated soil;
- guidelines for the application of sewage sludge on agricultural lands; and
- criteria for compost quality.

The new plan represents, in part, the ministry's response to comments received during the 1996 EBR registry posting.

Recent Developments - Progress on Air Standards

Since 1996, the ministry has worked extensively with business representatives and public interest groups to design a process for developing air standards that is more open and accessible. The generic

process has been modified to allow for formal consultation and input throughout. The setting of standards for air now follows a multi-step process which incorporates the key elements of priority setting, risk assessment, risk management and public consultation. This ensures that the full range of scientific issues and perspectives are considered in setting any new air standard.

The 1996 plan identified a number of priority candidates for development of air standards. Since that time, the ministry has completed work on the risk assessment of nine of those standards, risk assessments of an additional 18 have been published as information drafts and work on an additional 40 is in progress. Based on an intensive comparison to standards published by a number of other regulatory agencies, the ministry is also proposing that another 75 of its air standards be reaffirmed at their present values.

Water standards

Although this document focuses heavily on setting standards for air, work continues on standards for other environmental media. Ontario drinking water objectives have been set for more than 100 contaminants. Last year, three new ODWOs were established and one ODWO was reviewed and reaffirmed. Currently, nine more potential ODWOs are under review. There are already more than 240 provincial water quality objectives (*Water Management* 1994). Six new or revised PWQOs have been approved (1998), two additional PWQOs are proposed and 17 more are in progress. A number of new provincial sediment quality guidelines and tissue residue guidelines for the protection of birds and wildlife which consume aquatic life are under development in partnership with the Canadian Council of Ministers of the Environment (CCME).

Setting Environmental Quality Standards in Ontario: The Ministry of the Environment's Standards Plan

1.0 Introduction

The Ministry of the Environment (MOE) sets environmental quality standards to protect human and ecosystem health, prevent damage such as soiling and corrosion to the physical environment and minimize offensive odours. The term "standard" refers here to any limit placed on the presence of a contaminant in the ambient environment and, as used in this document, refers to all standards, guidelines, objectives and criteria used by the ministry. Standards can be either numerical values (for example, the maximum allowable concentration of a contaminant in air) or narrative descriptions (such as the requirement that odour associated with treated drinking water be inoffensive). Environmental quality standards form the basis of many of the ministry's programs and are developed for a wide variety of media including air, soil, ground water, surface water, drinking water, sediments and biota. Standards are used by the ministry to:

- determine compliance with Ontario's environmental regulations;
- define the legal limits for discharges to air and water in certificates of approval, control orders and program approvals issued under the *Environmental Protection Act* and *Ontario Water Resources Act*;
- assess general environmental quality and trends in data collected from its surveillance and monitoring programs;
- assist in making decisions during environmental emergencies or chemical spills; and
- assess the need for the cleanup or remediation of contaminated soils and sediment.

In 1996, the ministry published its standards-setting plan. The plan was posted on the *Environmental Bill of Rights* (EBR) electronic registry on Oct. 10, 1996 for a 60-day comment period. Notice was also placed on the ministry's Internet web site, a press release was prepared and circulated and paper copies of the plan were widely distributed. The plan described the types of standards used by the ministry, provided an overview of the standards-setting process and listed the priorities for developing new or revising existing standards during the ensuing three years. By publishing the plan the ministry also provided stakeholders with an opportunity to become more involved in that process. "Stakeholder" is a term commonly used by the ministry to identify anyone -- including representatives of business and industry, non-governmental organizations, municipal officials, academics and members of the general public -- with an interest in a particular environmental issue.

During the past two years, the ministry, in consultation with stakeholders, has developed a process for standards setting which is more open and accessible. This document, *Setting Environmental Quality Standards in Ontario*, is the first update of the standards-setting plan and includes a number of important changes to the 1996 plan, including:

- an amended set of priorities for setting standards for each media;

- refinements to the process used for setting standards for air contaminants; and
- a proposal to reaffirm 75 of Ontario's existing air standards at their present values.

Due to the extent of these changes and revisions, the plan is again being made available as a consultation draft to allow those interested an opportunity to submit comments and provide any additional information that would assist the ministry as it develops and updates Ontario's environmental quality standards.

2.0 Standards setting in Ontario

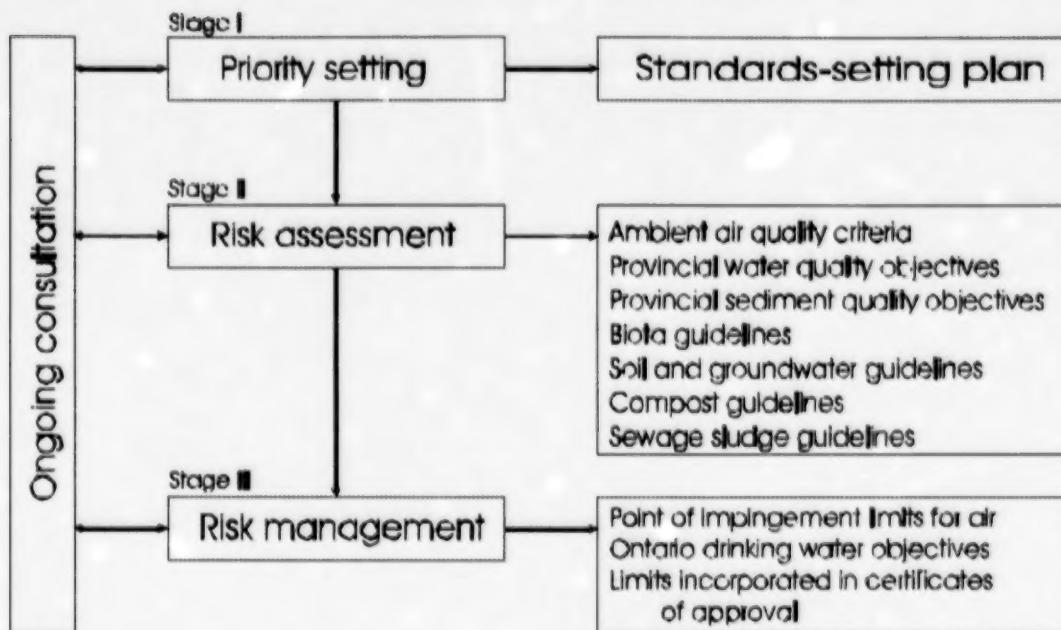
In keeping with the ministry's published *Statement of Environmental Values*, standards:

- are based on the best scientific information available;
- are set to protect the most sensitive receptors (e.g. sensitive sub-populations which includes children); and
- incorporate socio-economic considerations where appropriate.

The process for setting standards also recognizes that some contaminants can move through the natural environment, persist for long periods of time, and/or accumulate in the food chain. Certain receptors can also be exposed simultaneously through more than one environmental pathway – for example, through contaminants in the air they breathe, the food they eat and the water they drink -- which requires a multi-media approach to setting standards. Where there is uncertainty regarding the risk posed by a contaminant, the standards-setting process incorporates the precautionary principle and exercises caution in favour of the environment.

Setting standards follows a generic multi-step process (outlined in figure 1) which incorporates the key elements of priority setting, risk assessment, risk management and consultation. Depending on the standard being developed, additional steps may be employed. For example, in setting air standards, the ministry may consult with stakeholders prior to developing a limit based on risk to ensure that the full range of scientific information is considered. Additional factors, such as technical feasibility and cost, may also be considered in setting standards (as happens with air standards) or on a case-by-case basis (as happens when provincial water quality objectives are used to develop individual discharge limits in certificates of approval).

Figure 1: The standards development process.



Stage I: Priority setting

The ministry sets priorities for standards-setting. There are a number of factors the ministry uses to determine which contaminants require priority:

- needs identified to support various ministry programs;
- consideration of various lists such as the *National Pollutant Release Inventory* (NPRI) and federal priority substance lists;
- meeting MOE commitments to priorities of federal/provincial standards-setting working groups;
- reviewing ministry standards in response to new information related to environmental/ human health effects; and
- a preliminary evaluation of risk posed by the candidate substance.

The initial priority list is further refined based on the degree of risk presented from exposure to various chemicals and in consultation with clients and stakeholders.

Stage II: Risk assessment

Risk assessment is the scientific evaluation of the likelihood of adverse health effects due to exposure of

a human or non-human organism to a physical, chemical or biological agent. Risk assessment consists of four major steps. **Hazard identification** describes the type of adverse effect associated with the agent, using existing scientific literature. **Dose-response assessment** determines the relationship between the amount of exposure and the probability of the adverse effect.

In **exposure assessment**, the concentration, frequency, duration and route of exposure of the organism to the agent are determined. In **risk characterization**, Ontario-specific or relevant exposure and dose-response information are used to define the nature and magnitude of the risk in the province. The risks to the general population or segments of the population of greatest concern - such as children and the elderly - are determined, including an assessment of the uncertainties associated with those estimates. Risk assessment may be undertaken at a provincial level or at a local level, depending on the nature of the problem that is being assessed.

Stage III: Risk management

Setting a standard is a risk management policy decision which integrates information from the risk assessment (i.e. potential for adverse effects as well as any measures of uncertainty) with economic and technical feasibility considerations. It is recognized that adverse effects may be associated with very low levels of some contaminants. Where implementation of a proposed standard would require significant costs to achieve, a cost-benefit analysis is carried out. This information is used to develop implementation options for the standard. Risk management analyses are used in setting province-wide standards (e.g. air and drinking water standards) and consider all major sources of environmental releases. Risk management analyses are also used in applying a standard on a site-specific basis (e.g. application of surface water quality objectives after considering site-specific and local source characteristics). Public consultation is a key part of the risk management process.

Risk management considerations in MOE's process for setting environmental standards are intended to provide for flexibility, fairness, economic efficiency and effectiveness in achieving environmental protection goals and do not prescribe how regulated sectors will meet the standards.

3.0 Air quality standards

The Ministry of the Environment maintains a listing of more than 300 ambient air quality criteria (AAQC) and the corresponding point of impingement (POI) limits that is available on request. AAQC are used for assessing general air quality and the potential for causing an adverse effect. POI limits are used primarily to review applications for certificates of approval for emissions to air and to assess compliance with Ontario Regulation 346 (General - Air Pollution).

Many of Ontario's air standards were established more than 20 years ago. Since that time, the science of risk assessment has advanced significantly. Accordingly, in both this version of the standards-setting plan, *Setting Environmental Quality Standards in Ontario*, and the previous version, the ministry has placed particular emphasis on reviewing and updating existing air quality standards to ensure that they are current and protective of human and ecosystem health. Processes, however, have been developed to identify new substances for which formal standards should be developed and the overall process for

developing air standards has been revised.

3.1 The revised air standards setting process

During the past two years, the ministry has worked extensively with stakeholders to design a process for developing air standards that is more open and accessible. The generic process for setting standards (outlined in figure 1) has been modified to allow for formal consultation and input throughout. Following the priority-setting step, risk assessment and risk management information relevant to establishing a standard for a particular compound is documented in an information draft and made available for review through the EBR registry. This provides stakeholders with the opportunity to provide any additional information they feel should be considered by the ministry in setting an air quality standard for a particular substance, ensuring that the full range of scientific issues and perspectives are considered.

The ministry also participates in the development of air quality standards for substances of national priority, through partnerships with the Canadian Council of Ministers of the Environment (CCME) and a working group established under the *Canadian Environmental Protection Act* federal/provincial advisory committee. Standards established through these groups also follow a risk assessment and risk management approach similar to that used in Ontario. As activities for the development of standards proceed through these partnerships, the ministry will ensure that any consultation efforts undertaken nationally are co-ordinated with consultation in Ontario under the *Environmental Bill of Rights*. The substances for which standards are currently under review nationally are listed in table 1(c).

3.2 Priorities for updating existing air standards

The 1996 plan identified 101 substances as candidates for air standards development. Since that time the ministry has undertaken a comprehensive new review of the air standards for all substances on the list referenced in section 3 and, based on that review, has placed air standards into one of two groups.

Group 1 – high priority candidates for air standard development

Substances were placed in Group 1 based on the following considerations:

- Toxicity – Toxicity was evaluated using professional judgment, weighing the toxicity of the substance as described in publications from a range of sources;
- Releases to atmosphere in Ontario – Release quantities were used as indicators for potential exposure. Substances were automatically included if they were among the top 40 substances released to the air in Ontario, as reported in the 1996 *National Pollutant Release Inventory*. These 40 substances account for more than 99 per cent of the total quantity of NPRI chemicals released to the air in Ontario; and
- Identification as priorities by federal and national committees – The ministry participates on federal and national committees that are developing air quality standards of national interest.

These committees have established their priorities based on input from their members.

Progress in reviewing the 70 substances now in Group 1 is described in the following four tables, each table listing substances at a different stage in the new standards-setting process. Several of these standards (table 1c) are being developed with other governments in Canada, either under the Canada-wide standards initiative of CCME or the federal-provincial working group.

Table 1(a): Group 1 substances - first release, 1998

Contaminant	Status	Contaminant	Status
Acetaldehyde	Completed	Formaldehyde	Completed
Arsenic (and compounds)	In progress *	Lead	Completed (1994)
Cadmium (and compounds)	In progress *	Methylene chloride	AAQC completed **
Carbon tetrachloride	Completed	Nickel (and compounds)	In progress *
Chromium (hexavalent)	In progress *	Perchloroethylene	AAQC completed **
Cyclohexane	In progress *	Styrene	Completed
Dichlorobenzene, para-	Completed	Trichloroethylene	AAQC completed**, interim POI proposed December, 1998
Ethylene dichloride	Completed		

* Initial standards proposal posted to EBR in 1998; undergoing revision and preparation of information drafts and establishment of risk management process

** Substances undergoing risk management analysis to develop POI limits and implementation strategies.

**Table 1(b): Group 1 substances - information drafts posted to EBR registry
Jan. 22, 1999 for 90-day comment period**

Contaminant	Contaminant
Acrylonitrile	Isopropyl benzene
Ammonia	Methanol
Chlorine	Methyl ethyl ketone
Chloroform	Methyl isobutyl ketone
Ethyl benzene	Mineral spirits
Ethyl ether	Propylene oxide
n-Heptane	Toluene
n-Hexane	Dichloroethene 1,1-
Hydrogen chloride	Xylenes

Table 1(c): Group 1 substances - being developed, or to be developed, through a national process * over several years

Contaminant	Status	Contaminant	Status
Ozone	In progress * (CWS)	Sulphur dioxide	To be developed * (F/P)
Particulate matter: PM ₁₀ - particulate matter < 10µm PM _{2.5} - particulate matter < 2.5µm	In progress * (CWS)	Total reduced sulphur (TRS) and component compounds (dimethyl disulphide, dimethyl sulphide, hydrogen sulphide, mercaptans)	In progress * (F/P)
Nitrogen oxides (NO _x)	To be developed* (F/P)		

* Substances being developed through one of two federal/ provincial partnerships: CWS (Canada-wide Standards under CCME); F/P (federal/ provincial working group under the Canadian Environmental Protection Act - Federal/ Provincial Advisory Committee).

Table 1(d): Group 1 substances - remaining high priority air standards to be reviewed by the ministry

Contaminant	Contaminant
Acetone	Ethylene oxide
Acetonitrile	Hexamethylene diisocyanate monomer
Acrolein	Hydrogen fluoride
Benzene **	Hydrogen cyanide
Benzo[a]pyrene	Manganese (and compounds)
Butadiene, 1-3	Mercury **
Butanol, n-	Methyl chloride
Butanol, is-	Phenol
Chlorinated dibenzo-p-dioxins (CDDs) and furans **	Phosphoric acid (as P ₂ O ₅)
Chlorine dioxide	Propanol, iso-
Chloroethane	Propylene
Copper	Sulphuric acid
Dichloroethane, 1,1-	Trimethylbenzene, 1,2,4-
Diethylhexyl phthalate (DEHP)	Vanadium
Diethyl phthalate (DOP)	Vinyl chloride
Ethylene	Zinc

** In addition, emission technology standards are being developed for these substances through the Canadian Council of Ministers of the Environment Canada-wide Standards Initiative.

Group 2 – all other (Ontario) listed air standards

Development of air standards for substances in Group 2 are considered lower priority than those in Group 1. However, all standards for substances in Group 2 have been newly assessed against published guidelines, standards or exposure limits used by a number of other regulatory agencies. On the basis of that review, the ministry is proposing that 75 of the Group 2 air standards be reaffirmed at their present values. These 75 standards (which are highlighted in bold text in Table 2) are considered current and need not be reviewed using a formal risk assessment approach at this time, or before standards for other substances on either the Group 1 or Group 2 lists have been re-examined. Furthermore, the designation of a substance as not in need of review does not preclude an earlier re-examination of the substance's toxicity in the event that new information becomes available. Details of the review process and rationales for each air standard being reaffirmed are available in an accompanying report, entitled *Reviewing Ontario's Air Standards*.

In general, standards for the substances in Group 2 requiring further review will be addressed after completion of the Group 1 list. However, a number of substances in Group 2 may be reviewed before work is complete on several of the Group 1 substances that are subject to a national review process (as is the case for uranium). In any event, priorities may change in the face of new information.

Table 2: Group 2 air standards - the ministry is proposing to reaffirm air standards for the 75 substances listed in bold text, at their present values. Details of the proposal are available in the accompanying report – *Reviewing Ontario's Air Standards*.

Acetic acid	Diborane	Haloperidol	Phosphorus pentachloride
Acetophenone	Dibromotetrafluoroethane (Halon 2402)	Hexachlorocyclopentadiene	Phthalic anhydride
Acetylene	Dibutyl amine	Hexamethylenimine	Pimozone
Acrylamide	Dibutyl phthalate (DBP)	Hexamethyl disilazane	Platinum - water soluble compounds
Adipic acid	Dibutyltin dilaurate	Hexamethylene diisocyanate trimer	Polybutene-1-sulphone
Alkytoluene sulphonamide, n-	Hexamethylenediamine	Hexylene glycol	Polychlorinated biphenyls (PCBs)
Allyl glycidyl ether Dicapryl phthalate (DCP)	Dichloro-1,1,2,2, - tetrafluoroethane, 1,2 (Freon 114)	Hydrogen bromide	Polychloroprene
Aluminum distearate	Dichlorobenzene, ortho-	Hydrogen peroxide	Potassium cyanide
Aluminum oxide	Dichlorobenzidene, 3,3-	Iron - metallic	Potassium hydroxide
Aluminum stearate	Dichloroethylene, cis-1,2-	Isobutyl acetate	Potassium nitrate
Aluminum tristearate	Dichloroethylene, sym-1,2-	Isopropyl acetate	Propanol, n- (Propyl alcohol)
Ammonium chloride	Dichloroethylene, trans-1,2-	Isopropyl ether	Propionaldehyde
Amyl acetate, iso-	Diethyl amine	Lead, in dustfall	Propionic acid

Table 2: Group 2 air standards - the ministry is proposing to reaffirm air standards for the 75 substances listed in bold text, at their present values. Details of the proposal are available in the accompanying report -- *Reviewing Ontario's Air Standards*.

Amyl acetate, -	Diethyl phthalate (DEP)	Lindane (hexachlorocyclohexane)	Propionic anhydride (as Propionic acid)
Amyl acetate, secondary	Diethylene glycol monobutyl ether	Lithium hydrides	Propyl acetate, n-
Antimony and compounds	Diethylene glycol monobutyl ether acetate	Lithium, other than hydrides	Propylene dichloride
Arsine	Diethylene glycol monoethyl ether	Magnesium oxide	Propylene glycol
Asbestos (fibres > 5 µm in length)	Diethylene glycol monoethyl ether acetate	Magnesium stearate	Propylene glycol methyl ether
Asbestos (total)	Diethylene glycol monomethyl ether	Malathion	Propylene glycol monomethyl ether acetate
Barium - total water soluble	Difluorodichloromethane (Freon 12)	Maleic anhydride	Pyridine
Benzoic acid	Dihexyl phthalate (DHP)	Mercaptobenzothiazole disulphide	Quinone
Benzothiazole	Dilisobutyl ketone	Metaldehyde (acetaldehyde tetramer)	Selenium
Benzoyl chloride	Dimethyl acetamide, n,n-	Methacrylic acid	Silane
Benzyl alcohol	Dimethyl amine	Methane diphenyl diisocyanate (MDI)	Silica - respirable (<10 µm diameter), cristobalite
Beryllium and compounds	Dimethyl ether	Methoxy-1-propyl acetate, 2-	Silica - respirable (<10 µm diameter), quartz
Biphenyl	Dimethyl methylphosphonate	Methoxychlor	Silica - respirable (<10 µm diameter), tridymite
Borax	Dimethyl phthalate (DMP)	Methyl acrylate	Silver
Boric acid	Dimethyl sulfoxide	Methyl bromide	Sodium bisulphite
Boron	Dimethyl-1,3-diamino propane, n,n-	Methyl ethyl ketone peroxide	Sodium chlorate
Boron tribromide	Dioxane	Methyl mercapto aniline	Sodium chlorite
Boron trichloride	Dioxolane, 1,3-	Methyl methacrylate	Sodium cyanide
Boron trifluoride	Diphenylamine	Methyl salicylate	Sodium hydroxide
Bromacil	Diquat dibromide, total in ambient air	Methyl styrene, alpha	Sodium nitrate
Bromine	Diquat dibromide, respirable	Methyl tert-butyl ether	Stannous chloride (as Sn)
Bromochlorodifluoromethane (Halon 1211)	Dodecyl benzene sulphonic acid	Methyl-2-hexanone, 5-	Strontium
Bromoform	Dodine	Methyl-2-pyrrolidone, n-	Strontium carbonate
Bromotrifluoromethane (Halon 1301)	Droperidol	Methylal	Strontium hydroxide
Butanol, tertiary	Dustfall	Methylene dianiline	Strontium oxide
Butoxy-2-propanol, 1-	Ethanol (ethyl alcohol)	Methylene iodide	Sulfamic acid
Butyl acetate, n-	Ethyl acetate	Methylene-bis-2-chloroaniline, 4,4-	Sulphur hexafluoride

Table 2: Group 2 air standards - the ministry is proposing to reaffirm air standards for the 75 substances listed in bold text, at their present values. Details of the proposal are available in the accompanying report -- *Reviewing Ontario's Air Standards*.

Butyl acrylate	Ethyl acrylate	Methyl-n-amyl ketone	Suspended particulate matter, <44 μm aero. diam.
Butyl benzene sulphonamide, n-	Ethyl hexanol, 2-	Miconazole nitrate	Talc - fibrous
Butyl benzyl phthalate	Ethyl-3-ethoxy propionate	Milk powder	Tellurium - excluding hydrogen telluride
Butyl stearate	Ethylanthraquinone, 2-	Molybdenum	Tetrabutylurea
Calcium carbide	Ethylene dibromide	Monochlorobenzene	Tetrahydrofuran
Calcium cyanide (as total salt)	Ethylene glycol	Monomethyl amine	Tetramethyl thiram disulphide
Calcium hydroxide	Ethylene glycol butyl ether (butyl cellosolve)	Naphthalene	Thiourea
Calcium oxide	Ethylene glycol butyl ether acetate (but.cell.ace)	Naphthol, alpha-	Tin
Calcium stearate	Ethylene glycol dinitrate	Nitric acid	Titanium
Captan	Ethylene glycol ethyl ether (cellosolve)	Nitrilotriacetic acid	Titanium dioxide
Carbon black	Ethylene glycol ethyl ether acetate (cell.ace)	Nitroglycerine	Tolmetin sodium
Carbon disulphide	Ethylene glycol monohexyl ether	Nitrosodiethylamine, n-	Toluene diisocyanate
Carbon monoxide	Ethylenediaminetetra acetic acid (EDTA)	Nitrosodimethylamine, n-	Tributyltin oxide
Chloramben	Fentanyl citrate	Nitrous oxide	Trichlorobenzene, 1,2,4-
Chlordane	Ferric oxide	Octane	Trichloroethane, 1,1,1-(methyl chloroform)
Chlorodifluoromethane (freon 22)	Fluoridation - as total fluorides, total GS	Octene, 1-	Trichlorofluoromethane (freon 11)
Chloropentafluoroethane (CFC-115)	Fluoridation - as total fluorides, total NGS	Oleic acid	Trifluoroacetic acid
Citric acid	Fluorides (as HF) - gaseous, growing season GS	Oxalic acid	Trifluorotrichloroethane (freon 113)
Coal tar pitch volatiles - soluble fraction	Fluorides (as HF) - gaseous, growing season GS	Oxo-heptyl acetate	Trimethyl amine
Cobalt	Fluorides (as HF) - total, growing season GS	Oxo-hexyl acetate	Trimethylol propane
Cresols	Fluorides (as HF) - total, growing season GS	Palladium - water soluble compounds	Tripropyltin methacrylate
Cyanogen chloride	Fluorides (as HF) - total, non-growing season NGS	Paraquat dichloride - respirable	Uranium
Dalapon sodium salt	Fluorides (as HF) - total, non-growing season NGS	Paraquat dichloride - total in ambient air	Warfarin
Decaborane	Fluorides in dry forage, dry weight	Penicillin	Whey powder
Decane, n	Fluorinert 3M-FC-70	Pentaborane	Zinc chloride
Decene, 1-	Formic acid	Pentachlorophenol	Zinc stearate

Table 2: Group 2 air standards - the ministry is proposing to reaffirm air standards for the 75 substances listed in bold text, at their present values. Details of the proposal are available in the accompanying report -- *Reviewing Ontario's Air Standards*.

Detergent enzyme (subtilisin)	Furfural	Phosgene	
Diacetone alcohol	Furfuryl alcohol	Phosphine	
Diazinon	Glutaraldehyde	Phosphorus oxychloride	

3.3 Identifying new substances for standards development

To ensure environmental protection, many jurisdictions have developed processes to screen new substances for their environmental impact. These assessments may be based on the available scientific literature, experience in other jurisdictions and work that has been done in the field of occupational health. In a similar manner the Standards Development Branch supports the ministry's approvals function by reviewing the toxicology of substances for which the ministry has no formal standard or guideline. If a new application for a certificate of approval refers to such a substance, Standards Development Branch staff will review available toxicological data and provide the ministry's Approvals Branch with a site-specific assessment of the substance's predicted ground-level concentration. If the assessment is favourable, the approval will be granted. Where a number of requests for site-specific review are received for a specific substance, that substance may be added to the Group 2 substance list for future development of standards.

4.0 Ontario drinking water objectives

Ontario drinking water objectives (ODWOs), which have been set for more than 100 contaminants, are used to assess the quality of drinking water in the province. All public and private water works which supply more than five households must, as a general condition of their certificate of approval, be able to supply drinking water which meets Ontario drinking water objectives. ODWOs are also used by the ministry in assessing the potential human health risks which may result from spills to surface or groundwater sources which may be used to supply drinking water.

In setting ODWOs, Ontario generally adopts Canadian drinking water guidelines developed by the federal/provincial/territorial sub-committee on drinking water. This committee was established in 1986 as a standing committee with membership from the federal government and each province and territory. Under the process used to set Canadian drinking water guidelines, Health Canada undertakes the risk assessment, while each province and territory is responsible for evaluating the potential technical or economic issues associated with applying the guideline within its respective jurisdiction.

Before adopting a Canadian drinking water guideline as an ODWO, the ministry undertakes consultation through the EBR registry. In certain cases, the federal/provincial sub-committee may choose to undertake consultation nationally on a proposed Canadian drinking water guideline and the ministry will co-ordinate its consultative efforts under the EBR with those being undertaken nationally.

4.1 Priorities for Ontario drinking water objectives

Priorities for Canadian drinking water guidelines, and thus ODWOs, are determined mainly by the members of the federal/provincial/territorial sub-committee on drinking water. Priorities are based on potential toxicity, as well as the likelihood that a particular contaminant can be found in, or can enter drinking water supplies in Canada. In certain cases, the Ministry of the Environment may choose to develop an ODWO independent of the national process. In so doing, the ministry follows the general practices set out by the sub-committee in setting Canadian drinking water guidelines. Priorities for the development of ODWOs are outlined in Table 3 below. Standards listed as "in progress" are expected to be completed within one to two years.

Table 3: Status of Ontario drinking water objectives, recently or currently under development

Contaminant	Status	Contaminant	Status
1,1-Dichloroethylene	Completed	Haloacetic acids	Under consideration
Chloramines	Completed	Haloacetonitriles	Under consideration
Cyanide	Completed	Lindane	In progress
Tetrachloroethylene (perchloroethylene)	Completed	MOPA (4-chloro-2-methylphenoxy acetic acid)	Under consideration
Aldicarb	In progress	Microcystin-LR	In progress
Aluminum	Completed	Organotins	Under consideration
Antimony	In progress	Protozoa (crypto sporidium, giardia)	Under consideration
Arsenic	In progress	Radionuclides (including tritium)	In progress
Bacteriological quality	In progress	Temephos	In progress
Bromate	In progress	Total dissolved solids	In progress
Chloral hydrate	Under consideration	Total petroleum hydrocarbons	Under consideration
Chlorates, chlorites and chlorine dioxide	Under consideration	Trilallate	In progress
Cyanogen chloride	Under consideration	Trichloroethylene	Under consideration
Dichloroprop	In progress	Uranium	In progress
Fluoride	In progress	Viruses	In progress
Disinfection byproducts	Under consideration		

5.0 Provincial water quality objectives

Provincial water quality objectives (PWQOs) apply to surface water in the province and define maximum desirable concentrations of chemicals satisfactory for aquatic life and recreation, including taste and odour. Health of aquatic life is equally the driving consideration and in this case PWQOs are developed to protect the most sensitive aquatic life-stage for an indefinite exposure, with an added margin of safety. A more thorough discussion of the ministry's surface water policy can be found in *Water Management 1994*:

"Provincial water quality objectives are intended to provide guidance in making water quality management decisions such as the designation of the surface waters of the province which should not be further degraded. They are often used as the starting point in deriving waste effluent requirements included in certificates of approval and other instruments issued to regulate effluent discharges. They are used to assess ambient water quality conditions, infer use impairments, assist in assessing spills and monitoring the effectiveness of remedial actions."

Socio-economic issues, such as technical feasibility and cost, are not considered when developing PWQOs. These factors are considered during the application of the standards. PWQOs are applied on a case-by-case basis in the ministry's water management activities including the approvals process. The ministry has developed PWQOs for more than 240 chemicals and other polluting substances.

Most of the existing PWQOs were developed internally by ministry staff following a published protocol: *Ontario's Water Quality Objective Development Process 1992*. The strategy for creating new standards and updating older standards is, in part, done in co-operation with CCME on national standards. Through active participation on the national Canadian water quality guideline task group, established under CCME, Ontario develops and updates standards and adopts them for Ontario's use. The development of Canadian water quality objectives follows a process similar to Ontario's. Ontario also develops standards for substances which may not be a national priority, yet are important to Ontario.

Priorities for development of standards are based on presence or potential presence in Ontario industrial effluents (the *Effluent Monitoring Priority Pollutant List 1987* with updates), requests from internal ministry clients, age of the standard and harmonization efforts with Canadian environmental quality guidelines. Priorities for the development of provincial water quality objectives are listed in table 4. Standards listed as "in progress" are expected to be completed within one to two years.

Table 4: Status of provincial water quality objectives, recently or currently under development

Contaminant	Status	Contaminant	Status
Carbaryl	Completed	Benzene	Under consideration
Chromium	Completed	Chlorophenols	Under consideration
Dinitrotoluenes	Completed	Copper	Under consideration
Hexachlorocyclopentadiene	Completed	Cyanide	Under consideration
Hexachloroethane	Completed	Dissolved oxygen	Under consideration
Molybdenum	Completed	Fluoride	Under consideration
N-Nitrosodimethylamine (NDMA)	Completed	Hexachlorobutadiene	Under consideration
Vanadium	Completed	Inorganic lead	Under consideration
Ammonia	In progress	Mercury	Under consideration
Arsenic	In progress	Nitrates	Under consideration
Cadmium	In progress	Pesticides (up to 15 chemicals)	Under consideration
Chlorine	In progress	Phosphorus (Off Shield)	Under consideration
Chlorobenzenes (up to 8 chemicals)	In progress	PAHs (12 chemicals)	Under consideration
Ethylene glycol	In progress	Phthalates	Under consideration
Propylene glycol	In progress	Selenium	Under consideration
Atrazine	In progress	Suspended solids	Under consideration
Cyanazine	In progress	Temperature	Under consideration
Metribuzin	In progress	Total dissolved solids	Under consideration
Simazine	In progress	Xylene	Under consideration
Picloram	In progress	Zinc	Under consideration
MCPA (4-chloro-2-methylphenoxy acetic acid)	In progress		
Phosphorus (shield lakes)	In progress		

Notes:

- PWQOs already exist for substances in *italics*, but may be out of date or based on scant toxicity data.
- standards in progress are either approved CCME standards or are substances with incomplete evaluations

6.0 Biota guidelines

6.1 Tissue residue guidelines

As part of its mandate, the CCME task group also develops tissue residue guidelines (TRGs). TRGs establish maximum acceptable levels of contaminants in aquatic organisms so that the birds and wildlife which feed upon them will be protected from the adverse effects of chemicals in the environment. TRGs are aimed particularly at persistent bioaccumulative substances which accumulate in biological

tissues but which may be undetectable in surface waters, rendering water quality guidelines inappropriate. Development of these guidelines follows *Protocol for the Derivation of Canadian Tissue Residue Guidelines for the Protection of Wildlife that Consume Aquatic Biota* 1998. Ontario assisted in the development of this protocol and proposes to adopt these tissue residue guidelines. The TRGs will be used to assess whole fish monitoring data but are not used in sport fish guidelines which are human health related (see section 6.3). Tissue residue guidelines are given in Table 5. Standards listed as "in progress" are expected to be completed within one to two years.

Table 5: Status of tissue residue guidelines under development through the CCME	
Contaminant	Status
<i>DDT</i>	In progress
Dioxins/furans	In progress
<i>Mercury</i>	In progress
PCBs	In progress
Toxaphene	In progress
Mirex	Under consideration
PAH	Under consideration

Notes:

- PWQOs already exist for substances in italics, but may be out of date or based on scant toxicity data.
- standards in progress are either approved CCME standards or are substances with incomplete evaluations

6.2 Vegetation (upper limit of normal)

Vegetation can be injured by air pollution and, even if no injury occurs, vegetation can be a sink for many air contaminants. Therefore it is useful to have vegetation contaminant guidelines for use in interpreting environmental contaminant levels when conducting terrestrial effects investigations. In 1989 MOE published a list of 28 inorganic elements found in urban and rural vegetation collected from areas of no known point source of pollution. These vegetation background concentrations are referred to as upper limit of normal (ULN) contaminant guidelines. There is no plan to revise the ULN guidelines for vegetation; instead revisions will be accomplished through the MOE Ontario Typical Range (OTR) program, as described in section eight.

6.3 Sports fish consumption advisories

Ontario's sports fish consumption advisories are published in the *Guide to Eating Ontario Sport Fish*. They are designed as advisories for anglers and their families who may consume sport fish caught in Ontario rivers and lakes and are based on exposure guidelines developed by Health Canada. The

presence of six contaminants or groups of contaminants results in the majority of sport fish consumption restrictions in Ontario. These are mercury, PCBs, mirex/photomirex, dioxins/furans, toxaphene and DDT. The sport fish consumption guideline for mercury was recently modified on the basis of a reassessment of mercury's toxicity by Health Canada. The guideline for mirex/photomirex was also revised by Health Canada. Consumption advisories for other contaminants will be revised as Health Canada updates their guidelines.

7.0 Guidelines for sediment and lakefill quality

7.1 Provincial sediment quality guidelines

Provincial sediment quality guidelines continue to be the primary tool for management of sediment quality in Ontario. They are based on the distribution of sediment-dwelling animals as a function of sediment contaminant concentration (see *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario* 1993). These guidelines are not driven solely by contaminant level, but rather use contaminant levels to trigger biological impact studies. They consist of three levels of effect: no effect level, lowest effect level and severe effect level. There is an associated management scheme for contaminated sediments: *An Integrated Approach to the Evaluation and Management of Contaminated Sediments* 1996. The CCME Canadian sediment quality guidelines provide only a no effect level and their use is limited in the Ontario context. Priorities for the development of sediment quality guidelines are listed in table 6. Standards listed as "in progress" are expected to be completed within one to two years.

Table 6: Status of provincial sediment quality guidelines

Contaminant	Status
Dioxins/furans	In progress
Barium	Under consideration
Selenium	Under consideration
1,2,4-Trichlorobenzene	Under consideration
1,3,5-Trichlorobenzene	Under consideration

Notes:

- standards in progress are either approved CCME standards or are substances with incomplete evaluations

7.2 Lakefill guidelines

The ministry is developing lakefill guidelines. Lakefill guidelines will be used to protect water quality and are to be used during the placement of earth, rocks and similar material in or abutting a water body to create structures for flood and erosion control, land creation (e.g. waterfront parks) and confined

disposal facilities for dredged material. They will be based on provincial water quality objectives (1994), the provincial sediment quality guidelines (1992) and the *Guideline for Use at Contaminated Sites in Ontario* (1997).

8.0 Other environmental media

8.1 Soil and groundwater criteria

An extensive list of soil and ground water criteria were recently established and published in the *Guideline for Use at Contaminated Sites in Ontario* (MOE - revised February, 1997). The use of the criteria is triggered by change in land uses. The criteria establish cleanup targets for soil and groundwater remediation at contaminated sites. The guideline will be updated and amended periodically as new information regarding contaminant status becomes available.

In addition to the extensive set of cleanup criteria, the ministry is proceeding with the development of soil quality criteria to assist in making decisions regarding the placement/disposal of contaminated soil and soil-like materials. This will help divert some of the construction fill and other marginally contaminated materials from landfill sites and provide additional options for their placement in a manner that does not compromise environmental quality.

MOE is developing, with its CCME partners, Canada-wide standards for total petroleum hydrocarbons in soil. These are scheduled for completion in the spring/summer of 2000.

In 1993 MOE published a list of background concentrations for soil that contained 47 inorganic elements, seven monocyclic aromatics, 24 polycyclic aromatics, four halogenated cyclo, 22 halogenated aliphatics, 20 phenolics, 19 pesticides, 11 PCBs and 12 dioxins and furans. These concentrations were referred to as Ontario typical range. They represent the upper range of background concentrations in soil from across the province. The soil OTRs were used to form the Table F background-based guidelines in the *Guideline for Use at Contaminated Sites in Ontario*. The OTR program is ongoing. The first stage was to produce the soil OTRs for the *Guideline*. The OTR program will continue, with samples of soil and vegetation from various land-use classes being collected from across the province and the analysis conducted to develop OTR guidelines for soil and vegetation. The vegetation OTRs will replace the vegetation ULNs.

8.2 Sewage sludge

Guidelines for the application of sewage sludge on agricultural lands have been developed jointly by the ministries of the Environment and Agriculture, Food and Rural Affairs under the biosolids utilization committee. The guidelines, *Guidelines for the Utilization of Biosolids and Other Wastes on Agricultural Lands*, currently cover metals. Additional elements and other compounds are under consideration for future guideline development.

8.3 Composting guidelines

The ministry has established criteria for the quality of compost under Ontario Regulation 101/94 which lists ceiling limits for 11 metals in compost obtained from municipal leaf and yard waste composting facilities. The guidelines need to be reassessed due to changes in the criteria on which they were based. CCME is currently finalizing a national guideline for metals in compost and these will be assessed as part of the revision process.